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LAND MANAGEMENT AND SOIL QUALITY IN SAGO-BASED AGROFORESTRY SYSTEM: A STUDY ON MOOI TRIBE'S ECOLOGICAL KNOWLEDGE (SORONG, SOUTHWEST PAPUA) AND MODERN ECOLOGICAL KNOWLEDGE (MEK)

Diah Kartika Wulandari*[,1], Kurniatun Hairiah[2], Cahyo Prayogo[2]

[1] Soil and water management postgraduate program, Brawijaya University, Malang, Indonesia
[2] Soil Science Department, Brawijaya University, Malang, Indonesia

*Corresponding author
Email: diahkartikaw@student.ub.ac.id

Abstract*. Sago farmers from the Mooi tribe in Sorong Regency - Southwest Papua have consumed and cultivated sago for generations. This research aims to understand the local ecological knowledge (LEK) of sago farmers in managing their land to maintain soil quality in sago agroforestry, compared with modern/scientific environmental understanding. The survey was conducted from February to October 2021 in three sub-districts, Sorong Regency, using an exploratory descriptive method among Mooi sago farmers. Intact soil samples were taken to measure soil physical properties and disturbed soil samples to analyze soil chemical properties (pH, C-Organic, Total N, P, K, CEC, base saturation). The results of this research show that what sago farmers have in common with the unique habits of the Mooi tribe's harvest system is that they harvest enough sago starch to consume or sell if there is too much of it. According to sago farmers, the best land for growing sago is close to a water source and is not affected by soil biota and fertilization. and sago farmers will leave ella sago dregs on the land. Meanwhile, according to MEK, starch formation decreases in flooded land and the remaining sago dregs are very good for making compost and animal feed. In sago forests where sago grows naturally, the soil texture is dominated by silt, having a pH of 5.8-7.2; High total organic C 2.8-5.2%, P 14.08-66.44 mg/kg, K 755.3 – 1626.8 mg/kg, CEC 18-40 cmol(+)/kg, and base saturation 30 – 134%. These values are relatively higher than on land with a sago-based agroforestry system.*
Keywords: Local ecological Knowledge, Agroforestry Sago; Soil Quality.

1. Introduction

Sago (*Metroxylon* sp.) is a source of carbohydrates for some people in several parts of the world, especially in eastern Indonesia (Dimara *et al.*, 2023). Indonesia has the largest growing area for sago trees in the world, and sago is one of the most important biological resources (Kadir *et al.*, 2021; Kamma *et al.*, 2021). Sago is considered one of the plants that can answer the global crisis of world food needs and security because it can be grown on marginal land (wet, swamp, saline), and produces large amounts of starch in one tree (Lim *et al.*, 2019; Ehara *et al.*, 2018). The area of the sago forest has begun to change its function to become a residential area or to other plants (Musfira & Ohee, 2019). One effort to maintain the existence of sago and increase the economic value of sago plantations is Sago Agroforestry or sago intercropping (Syafiuddin *et al.*, 2021).

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Agroforestry is a sustainable land management practice that has shown its role in improving soil quality (Dollinger & Jose, 2018). Agroforestry has adaptive strengths to counter the effects of climate change (Hendri *et al*., 2023), maintain the biodiversity of soil flora and fauna (Jose, 2012), and increase soil organic carbon (Lorenz & Lal, 2014). Traditional agroforestry systems based on local knowledge have been recognized by sago farmers in Papua (Hendri *et al*., 2023). According to Amoah and Adoah (2018), local ecological knowledge influences good environmental management. The sustainability of agricultural land is strongly influenced by soil management, especially in maintaining soil quality (Bicalho & Peixoto, 2016), which can be measured by the level of soil density (Lal, 2016), earthworm density, and diversity (Mardiani *et al*., 2022), soil organic carbon content and soil carbon biomass (Bautista-Cruz *et al*., 2017).

There has been quite a lot of research on sago plants, such as research conducted by Dimara *et al*. (2023) and Ehara *et al*. (2018) which discussed the characteristics of sago soil fertility in natural forests, where sago trees grow naturally. However, so far, research on sago agroforestry has only studied the types of plants that exist in agroforestry plots (Siburian, 2016). Knowledge about local sago ecology has only been studied to the extent of cultivation (Asmuruf *et al*., 2018), types of sago planted, and estimates of harvest yields (Schuiling, 2009). From the description of previous research, it can be seen that the research gap is that no one has studied the fertility of sago soil on sago agroforestry land, and land management has not been researched from the perspective of modern ecological knowledge. Therefore, in this research, the researcher wants to study and understand land management and soil quality on the sago agroforestry system. This study is based on local ecological knowledge of the Mooi tribe and modern ecological knowledge where the Mooi tribe sago farmers have been cultivating sago agroforestry in their gardens.

2. Methods

2.1 Study Area

Referring to previous research methods (Asmuruf *et al*., 2018; Botanri *et al*., 2011), the sample size was determined using the judgment sampling/purposive random sampling method in three districts of Sorong Regency, Southwest Papua, Indonesia: Makbon, Aimas, and Mayamuk. These three districts were chosen because they are the central suppliers of people's sago for Sorong Regency. The research was conducted exploratively from February to October 2021 (Figure 1).

2.2 Subject and object of research

The subjects in this research were sago farmers from the Mooi tribe. The Mooi tribe was chosen because they are an indigenous tribe that inhabits the Sorong district and its surroundings. They consume sago as a staple food and have implemented an agroforestry system for more than

20 years. Meanwhile, the objects of this research are land management and soil quality in incoming sago forests and sago agroforestry. Respondents in this study were taken purposively with the criteria of (1) The Mooi tribe, (2) sago farmers in sago forests, and/or sago agroforestry. Meanwhile, for soil samples, in 1 district, 2 samples were taken representing sago forest and sago agroforestry.

2.3 Data

Primary data is the data obtained directly through interviews with respondents, field observation data, and the results of soil sample analysis (pH, C-organic, P, K, CEC, base saturation, bulk density, Particle Density, and soil structure) carried out in the laboratory. Secondary data includes rainfall data, exposure time, and previous research journals. The results of interviews, field observations, and analysis of soil samples obtained were used as local ecological knowledge (LEK) of Mooi Tribe sago farmers, then compared with research results that have been published in related modern scientific journals or Modern Ecological Knowledge (MEK) for sago management. The data obtained in the research would be analyzed descriptively and presented in the form of tables and images (photos).

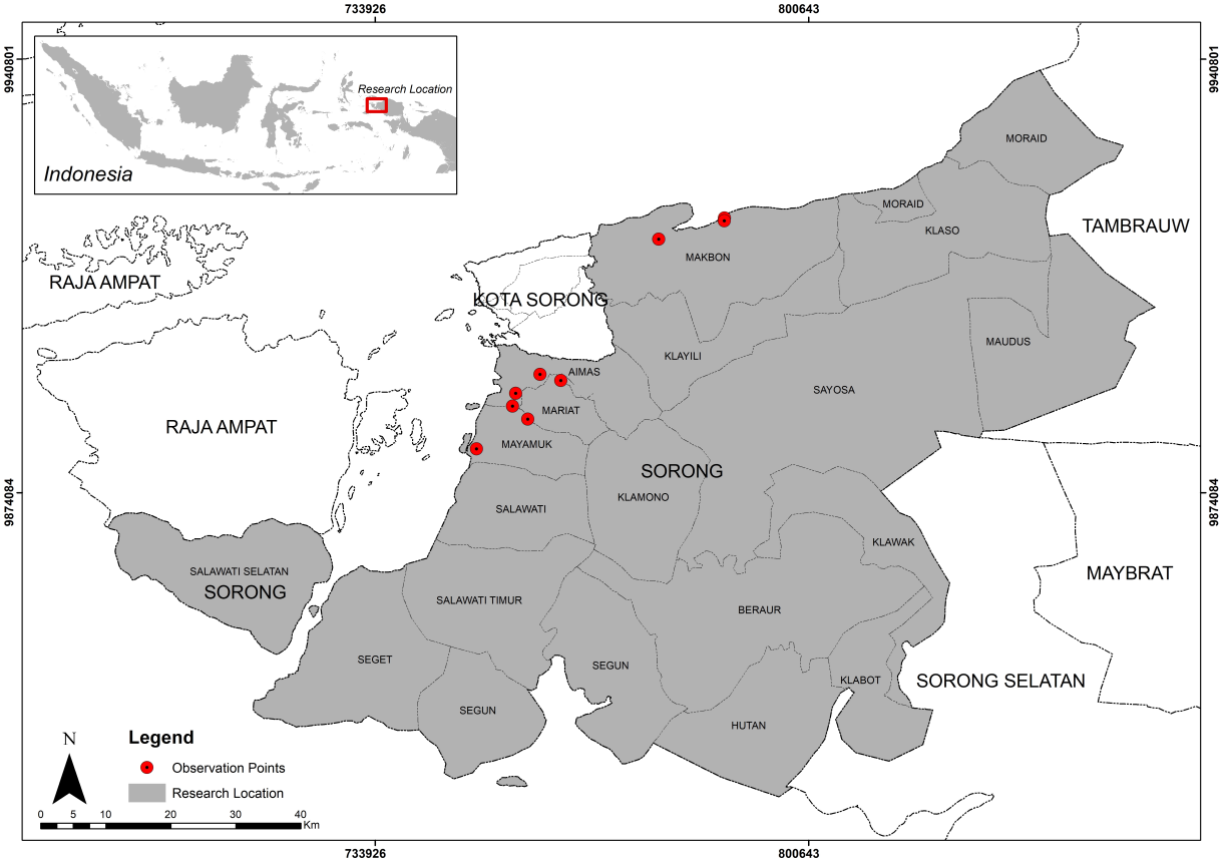


Figure 1. Research location

3. Results and Discussion

3.1. The condition of the research location

3.1.1. Rainfall and sunshine duration

Rainfall data and sunshine duration were obtained from the Meteorology, Climatology, and Geophysics Agency (BMKG) class 1 station DEO Sorong (data for 2011-2021) ranging from 166-396 mm/month and is classified into climate type A (very wet) based on Schmidt–Ferguson classification. As for the data, the sunlight lasts between 4.4 – 6 hours (Figure 2).

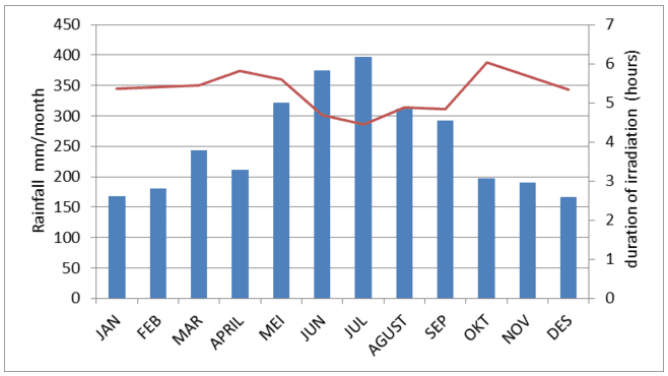


Figure 2. Average rainfall and duration of irradiation in Sorong Regency
Note: Bar data represent rainfall data and line data represent duration of irradiation data

3.1.2. Land condition

Calculation of the Basal Area (BA) of a tree was carried out to determine the area occupied by trees. The data was used to distinguish the classification of land use systems (SST) classified as agroforestry (AF) or monoculture. According to Hairiah *et al.* (2003) and Purnamasari *et al.* (2022), land that has LBD under 80% can be classified as Agroforestry land. Sago forests grow naturally (Kadir *et al.*, 2022), where the vegetation is behind the mangrove and nipa forests. The results of Lense's research (2010) state that in sago forests that are ready to be harvested, there are several other types of forest plants. Table 1 shows the Sago Agroforestry land.

Table 1. Characteristics of Sago Agroforestry land

Research Location	Number of plant species (trees)	Plant Type	Total tree population /Ha	Basal Area Value (%)
Makbon sago agroforestry	5	Sago (*Metroxylon* sp.), Durian (Durio Zibethinus), Bamboo (Bambusoideae), Olive (Lansium Domesticum var. pubescens), Manggo (Mangifera indica)	650	63
Aimas sago agroforestry	5	Sago *Metroxylon* sp., Matoa (Pometia pinnata), Cedar (Artocarpus Integer), Coconut (Cocos nucifera), Bamboo (Bambusoideae),	525	46
Mayamuk sago agroforestry	2	Sago (*Metroxylon* sp.), Coconut (Cocos Nucifera),	325	66

3.2. Respondent Characteristics

The Mooi tribe is an indigenous tribe that lives in Sorong Regency. Land ownership in the

Mooi tribe is inherited through the male clan line and is called customary land (Markus *et al*., 2022). Mooi community sago farmers are aged 27-74 years with the majority having an elementary school education. This results in low opportunities to work outside the agricultural sector (Liu *et al*., 2022). The location of Makbon District is quite far from the center of Sorong Regency or the market, so its residents are very dependent on the natural resources around them and they also depend on the results of the Bat Island tourist boat rental service. Residents of Aimas District who work as sago farmers have no choice but to farm. In the Mayamuk District, apart from being a sago farmer, they are also involved in tourism by opening a marine vehicle rental business and selling souvenirs (Yanti & Leiwakabessy, 2023), and they also become a coral collector. One of the similarities and uniqueness of the sago harvesting system used by the Mooi Tribe is that they harvest sago starch for eating or selling. This is the reason why there are still many sago trees that have not been harvested, both in forests and on agroforestry land.

The distribution of workers' roles when harvesting sago in the garden are men are tasked with tearing down, splitting, and "*menokok*" sago trees, while women's main job is squeezing sago starch or helping to cut down and split sago trees (Maryone, 2018).

3.3. Sago land management and maintenance of soil quality according to Local Ecological Knowledge (LEK) of sago farming communities (Mooi Tribe) and Modern Ecological Knowledge (MEK)

Types of plants planted with sago

Sago farmers acquire farming knowledge from the family, which is passed down from generation to generation and varies between places (Table 3). They choose the seeds to be planted in an L shape, which is the most different among the three agroforestry districts. In the Mayamuk District area, there is only one other type of plant, namely coconut (Cocos nucifera); where one of the farmers believes that plants other than coconut will eventually die (not survive long). This is possible because sago contains allelopathy (Syakir *et al*., 2008).

Shading effect

The response of sago farmers to shade trees is quite mixed. In Makbon District, sago farmers say shaded sago trees tend to have low starch content because the fruit trees are larger than sago and their canopy covers the sago canopy. Meanwhile, in Aimas District, even though it is adjacent to various fruit plants, it is still exposed to direct sunlight. Likewise, in the Mayamuk District, coconut trees are planted around sago trees or groves and according to respondents, there are no problems between one type and another. Therefore, it can be concluded that sago requires sufficient sunlight (Dalimunte *et al*., 2019). Sago is a C3 plant with a humidity of 90% and light intensity of 900 j/cm3/day (Schuiling, 2009).

Table 2. Local Ecological Knowledge (LEK) of Sago Farmers in each district regarding the management of crop soil on their land

LEK in Makbon District	LEK in Aimas District	LEK in Mayamuk District
Other types of plants		
In addition to sago, farmers plant their gardens with various kinds of mango (*Manggifera indica*), langsat (*Lansium domesticum*), durian (*Durio zibethinus*), bamboo (*Bambusa*), vegetables, gedi (*Abelmoschus manihot*) and moringa (*Moringa oleifera*).	In addition to sago, farmers plant a variety of matoa *(Pometia pinnata*), cedar (*Artocarpus integer)*, coconut (*Cocos nucifera)*, bamboo (*Bambusa*), banana (*Musa paradisiaca*), tubers such as patatas/sweet potato (*Ipomoea batatas*), and cassava (*Manihot esculenta).*	Other tree species planted with sago by farmers are only coconut trees (Cocos nucifera). According to them, other trees will die if planted near the sago.
Shading effect		
Sago that is shaded (accidentally by fruit trees because the planting location is close to fruit trees) has little coconut milk.	The shade does not matter as the result is the same whether it is shaded or not (however, the fact in the field is that there is a clear distance between the sago palm and other plants so that the side of the sago tree is shaded, not the top).	The denser the sago, the trees that shade it (or those that live around it) will die.
Place the planting hole		
Sago farmers plant sago near small streams or muddy soil.	Farmers plant sago near rivers or springs.	Planting sago on muddy or ankle-deep waterlogged land (+/-5 cm above ground level).
Characteristics of planted sago		
Are independent with very few tillers or between families with clear boundaries.		
Age and harvest characteristics of sago trees		
Harvest characteristics when sago begins to produce panicles usually start at the age of 8 years (depending on the sago variety). There is no difference in the age of harvest between sago in forest and agroforestry.	Harvest characteristics when the song begins to issue panicles usually start at the age of 6 years (depending on the sago variety). Sago in agroforestry land is harvested faster than sago in the forest	
Yields		
One sago tree produces 20-30 *tumang* wet starch (1 packet of *tumang* weighs 8-10 kg)	One sago tree produces 10 sacks of wet starch with a sack size of 15 kg.	1 sago tree produces between 20 and 30 *tumang* (1 *tumang* weighs 7-9 kg)

The planting hole and the characteristics of the sago are planted.

Sago farmers will plant their seeds near water sources (Asmuruf *et al*., 2018). This is possible because sago farmers observe nature. However, when they enter the next stage, 85% of sago seeds in nature die (Botanri *et al*., 2011). The distance between sago trees in sago agroforestry can be 5-7 meters, with 1 sago tree having 0-5 saplings around it. However, in the sago forest, the sago saplings are scattered randomly making it very difficult for farmers to enter the land (Figure 3).

(3a) (3b) (3c)

Figure 3. Sago agroforestry in three different locations.
(3a) Makbon Distric, (3b) Aimas District, (3c) Mayamuk Distric

Yield

Sago farmers in the three districts plant sago from various varieties. From the results of Schuiling (2009) research, sago varieties have the most influence on sago yields because there are varieties with large, tall morphology and there are also short and small ones, and this variety has the most influence on harvest age and the amount of starch in the sago tree. In Makbon District, one sago tree produces 20-30 tumang (a container of wet sago flour made from sago leaves) tubes of wet starch (1 pack of tumang weighs 8-10 kg). In Aimas District, one sago tree can produce 10-15 sacks containing 15 kg of wet starch. Meanwhile, in the Mayamuk sub-district, the wet starch yield is 20-30 tumangs with a tumang size of 7-9 kg. However, recent research states that sago harvest time can be based on the fertility of the soil where the sago grows (Amin *et al*., 2019).

Soil characteristics

According to sago farmers, the best land for planting sago is one that is close to a water source and is not affected by soil biota or fertilization. However, this opinion is not correct. The growth of sago trees is very dependent on the availability of essential nutrients including the supporting nutrients for sago plants P and K (Dalimunte *et al*., 2019). There seems to be a gap between the LEK of sago farmers and the current MEK in terms of land management and the products needed. These differences are briefly shown in Table 3 and Table 4.

The gap between LEK and MEK

A comparison of information regarding land management of sago farmers in each region compared to current modern knowledge is presented in Table 4.

Table 3. Local Ecological Knowledge (LEK) of sago farmers regarding soil management

No	LEK Sago Farmer	Makbon	Aimas	Mayamuk
1	Fertile soil for sago is that which is close to a water source and is black	✓	✓	✓
2	Ella sago dregs are still left in the fields near the starch extraction	✓	✓	
3.	Ella pulp (sago pulp residue) is still left in the fields, but some are starting to collect it to plant in pots.			✓
4	Sago does not require fertilizer. The main treatment is cleaning dry fronds, reducing tillers, and getting rid of other plants around it.	✓	✓	✓
5	Cleaning depends on the type of sago. Thorny sago is more difficult to clean than non-thorny sago		✓	
6	For farmers, the existence of land animals is not important except for sago caterpillars (*Rhynchophorus* sp.) which is used for consumption	✓	✓	✓
7	Sago trees that have a little starch left on the land will attract sago caterpillars (*Rhynchophorus* sp.) likewise those who have already panicked without being harvested	✓	✓	✓

Table 4. The gap between the currently developing LEK of sago farmers and MEK

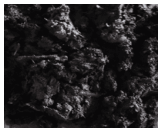
LEK	MEK
Sago caterpillars are allowed to live in sago stalks which produce low starch and are not harvested.	The Sago caterpillar (*Rhynchophorus* sp.) is a pest for sago plants (Mazza *et al*., 2014).
Sago trees that die due to lightning or are not harvested or because of low starch content will be left for sago beetle nests.	Dead sago trees must be destroyed since their presence becomes a nest for pests (Dalimunte *et al*., 2019).
Luwing or millipedes (Diplopoda) are commonly found in ella sago piles but are considered as unimportant soil animals.	Millipedes are one of the decomposers (Tóth & Hornung, 2019).
All types of soil that can support the growth of sago is fertile soil.	During the starch formation phase, the soil should not be waterlogged. (Riry, 2022)
The main feature of harvested sago is the release of panicles	The harvest time for sago varies between varieties and has different characteristics (Schuiling, 2009)
The seeds chosen for planting are L-shaped between the shoots and the direction of the hump	The best seeds to be planted are taken from sago trees which have the highest starch clusters. In the weaning phase, the food reserve (hump) is hard and L-shaped (Dalimunte *et al*., 2019)
The remaining dregs of sago (ella) and sago bark juice are useless, so they are left to be piled up on the land	The remaining ella sago waste and sago bark are very good for composting and soil nutrient improvement (Kaya *et al.*, 2019), the making of Biochar (Bohari *et al.*, 2020), and vermicompost (Elton *et al.*, 2014)

3.4. Comparison of soil quality in sago forest and sago agroforest where sago farmers carry out their activities

Soil quality is "the capacity of a soil to function within its ecosystem and land use boundaries to maintain biological productivity, maintain environmental quality, and improve the health of plants and animals" (Bünemann *et al*., 2018). Soil quality indicators include physical indicators (texture, structure, bulk density, porosity), chemical (pH, CEC, nutrient reserves), biological

(SOC, species diversity), and ecological properties (biodiversity), which among others have a water retention function, water cycle, buffering, leaching, carbon absorption, biota habitat, energy for soil organisms, and plant growth media (Lal, 2016). Sago land management greatly determines the quality of the soil at the research location.

Table 5. The color of the soil at the research location and the farmers' perspective

Land Title Local and Point of View	Appearance	Munsell color and description	Land location
Black Soil Fertile soil		10 YR 1/1, Black	Aimas sago forest, Mayamuk sago forest, Mayamuk agroforestry, forest topsoil, and Makbon agroforestry.
Black Soil Fertile soil but more fertile black soil		10 YR 3/2 Dark Brown	Aimas Agroforestry
Yellow Soil Fertile soil but more fertile black soil		10 YR 5/3 Brown	Makbon sago forest and Makbon Agroforestry
Yellow Soil Fertile soil but more fertile black soil		5Y 5/3 Olive	Makbon sago forest and Makbon Agroforestry

Sago farmers know the quality of the soil based on the color of the soil. There are differences in perceptions in the three research locations regarding soil color (Table 5). Sago farmers in Aimas and Mayamuk Districts only know black soil as fertile soil, while Makbon sago farmers know two types of soil colors, namely black and yellow. The soil color tends to be light in Makbon District, with an organic C content of 2.8% (medium) in sago forests and 1.7% (low) in agroforestry, while the black soil color in Aimas and Mayamuk Districts has a soil color that tends to be bright, with organic C content of 4.9% to 5.1% (high to very high). Soil color and organic C content are influenced by sago dregs that farmers throw onto the land. The percentage of soil organic C will be consistent with soil organic matter with indicators of darker soil color (Margolang *et al*., 2015).

According to sago farmers, whatever the color of the soil, as long as the plants grow, the soil is fertile. This statement is not wrong. The results of chemical analysis of soil N ranged from 0.3-0.7% in sago forests and 0.2 - 0.4% in sago agroforestry, P with 14-66 mg/kg soil in sago forests and 9-19 mg/kg in sago agroforestry, K ranged from 755 to 1626 mg/kg soil and 738-1319 mg/kg in sago forest. The high value of P and K is due to the effects of farmers' behavior in throwing away sago pulp on the land (Johan *et al*., 2022)

Table 6. Chemical properties of the soil under sago forest stands and sago agroforestry

Location	Land Use	pH (H_2O)	Organic C (%)	N (%)	C/N (%)	P (mg/kg)	K (mg/kg)	CEC (cmol/kg)	Base Saturation (%)
Makbon	SFE	7.1 (N)	2.8 (M)	0.33 (M)	8.48 (L)	14.08 (VH)	755.3 (VH)	18 (M)	92 (VH)
	SAF	5.1 (A)	1.77 (L)	0.22 (M)	8.45 (L)	9.68 (VH)	738.7 (VH)	14 (L)	74 (H)
Aimas	SFE	7.2 (N)	4.98 (H)	0.36 (M)	13.83(M)	17.16 (VH)	879.8 (VH)	30 (H)	134 (VH)
	SAF	5.9 (SA)	2.32 (M)	0.22 (M)	10.54(M)	9.24 (VH)	879.8 (VH)	38 (H)	76 (H)
Mayamuk	SFE	5.8 (SA)	5.17 (VH)	0.78 (VH)	6.62 (L)	66.44 (VH)	1626.8 (VH)	40.3 (VH)	30 (L)
	SAF	6.1(SA)	4.79 (H)	0.47 (M)	10.19 (L)	19.8 (VH)	1319.7 (VH)	61(VH)	54(M)

SFE= Sago Forest Entered, SAF= Sago Agroforestry, A: Acid, SA= Slightly Acid N=Neutral, L=Low M=Medium, H=High, VH=Very High. Based on the Criteria of the Indonesia Soil Research Institute (2007)

The pH of sago forest soil ranges from 5.8-7.2, and sago agroforestry ranges from 5.1-5.9. Although the criteria for neutral sago forest and agroforestry are slightly acidic, both can still maintain element content in the soil, one of which is P. CEC sago forests are 18-40.3 cmol/kg while the base saturation of sago agroforestry is 14-61 cmol/kg (low to high) and the base saturation of sago forests is 30-134% while the base saturation of agroforestry is 54-76%. The value of CEC and base saturation in the sago forest can match the value in the sago forest. This is supported by the statement of Santoro *et al.* (2020) who said that the function of agroforestry, especially regarding traditional agroforestry, has an important role in the sustainability of land because it is considered as important as forests. Even so, sago farmers do not yet know the concept of land sustainability; one concept of thinking about the land they manage is "Today I will plant, tomorrow my grandchildren will harvest".

Table 7. Analysis of soil physical properties under sago forest stands and sago agroforestry

Location	Land Use	BD	PD	%Soil Particle			Porosity	Soil Texture
		gr/Cm^3	gr/Cm^3	Sand	Silt	Clay	%	
Makbon	SFE	1.6	2.5	21	48	31	35	Loam
	SAF	1.6	2.5	29	46	25	33	Clay loam
Aimas	SFE	1.6	2.4	17	49	34	39	Clay loam
	SAF	1.5	2.5	23	41	36	34	Silty clay loam
Mayamuk	SFE	0.7	1.5	16	53	31	53	Silt loam
	SAF	1	2.2	20	54	26	54	Silty clay loam

SFE= Sago Forest Entered, SAF= Sago Agroforestry, BD= Bulk Density, PD= Particel density

Porosity, also called pore space, is the part of the soil that is not occupied by solid particles but by air and water and the arrangement of soil particles and aggregates determines the size of the pore space (Rabot *et al.*, 2018). Good soil for plant growth has a porosity ranging between 30-60%. If it is less than that, it will be difficult for plant roots to penetrate the soil and if it is more, the soil will not be able to hold water (Bintoro *et al.*, 2017). The research results show that sago forests and sago agroforestry have porosity values within the range. So, the presence of sago helps to maintain the continuity of water sources and water flows (Nelsi *et al.*, 2021). Sago farmers do not yet know the concept of soil porosity, soil texture, specific gravity, or soil particles, but sago farmers are familiar with sandy soil which is located between beach sand and clay. Muddy soil is

waterlogged soil, especially when it rains. The third type of soil is hard soil, especially when it is dry. These three types of soil are spread across sago forests and sago agroforestry.

Soil structure is a spatial arrangement of solids and voids at different scales without considering the chemical heterogeneity of the solid phase (Rabot *et al*., 2018). Based on the data in Table 7, the texture class found in the research area has a silt soil fraction composition. This will be related to the large cation exchange capacity of the soil. The attractive forces between clay-dominated soil particles are greater than dust-dominated soil so a silt-dominated texture will have more difficulty retaining nutrients than clay-dominated soil (Rabot *et al*., 2018).

(4a)

(4b)

(4c)

Figure 4. Diplopods found in sago agroforestry (5a) Adult diplopods with a size of 10 cm (5b) Diplopods with a size of 1-30 cm on top of ella sago piles (5c) Ella sago piles

The land animals that are found and live in sago dregs and are widely distributed around sago are of the Diplopoda type with a size of 1 cm to 10 cm (Figure 4). Sago farmers usually call them millipedes. Assuming the presence of diplopods does not disturb and harm agriculture, millipedes are the main group of soil macro detritivores and they significantly influence soil quality, especially through their important role in nutrient cycling (Tóth & Hornung, 2019).

4. Conclusions

This research examines land management and soil quality using local ecological knowledge and compares it with modern ecology. Research locations are in sago forests and sago agroforestry in Aimas, Mayamuk, and Makbon Districts, Sorong Regency, Southwest Papua. This research used exploratory description methods with purposive sampling interviews. Soil samples were taken and the results of this research were then compared with previous research. The results obtained show that sago farmers have the same and different knowledge regarding quality. Sago farmers believe that the fertile soil for sago is close to water sources. In caring for and maintaining sago plants, farmers assume that they do not use organic or inorganic fertilizers or pesticides and only carry out mechanical land clearing. This is different from modern ecological knowledge which uses the arrangement of canals or ditches, the use of organic and chemical fertilizers, and

herbicides. The remaining sago dregs (local name: ella) tend to be ignored and are just left on land around sago activities although ella sago is very good for making compost, glucose production, and animal feed. The presence of diplopod soil animals around the sago ella dregs is considered unimportant, even though one of the functions of these soil animals is as a decomposer. On the other hand, sago caterpillars (*Rhynchophorus* sp.) are sago pests, but their presence is considered important to be kept for consumption or sale by farmers.

In natural forests where sago grows naturally without human assistance, the soil texture is dominated by silt with a pH of 5.8-7.2; High total organic C of 2.8-5.2%, P of 14.08-66.44 mg/kg, K of 755.3 – 1626.8 mg/kg, CEC of 18-40 cmol (+)/kg, and saturation alkaline around 30 – 134%. This value is relatively higher but not much different when compared to land with a sago-based agroforestry system. This means that sago agroforestry can be a solution to maintain land sustainability and high productivity.

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